

## Integrating Environmental Sciences into Regular Higher Education Curriculum to Facilitate Transition into a Sustainable Society: A Case Study

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**Abstract:** We live in environmentally turbulent times where issues such as freshwater scarcity, soil and air pollution, natural disasters and depletion, biodiversity loss, and infectious diseases pose a serious danger for future generations. Climate change is one of the most significant modern threats, the solution to which requires the engagement of different social branches. Every year many students complete higher education institutions in Azerbaijan. From those, only 20% engage in environmental studies. As a result, only these graduates receive education in current environmental problems and their possible solutions. To tackle this problem, the Environmental Science course was introduced at ADA university for students from all disciplines, including policymaking, economy, technology development, and science. Since the Fall of 2017, more than 2,500 students have successfully completed the course as part of their bachelor's studies. In the scope of the program which includes both theoretical and field studies, students have visited the national reserves and parks, industry facilities, received insight into current global and local policies, and unresolved problems. The students have further developed and successfully presented their projects related to environmental health and circular economy. A number of students continued their education in the field of environmental policy diplomacy and currently work for local and international environmental organizations. The aim of this initiative is to support the transition towards a global circular economy, help address the country's pollution and deforestation issues, and preserve biodiversity through engaging youth from all areas of expertise in environmental problems of our times.

**Keywords:** Environmental science, Education, Environmental Ethics, Public Awareness

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## Introduction

### Environmental health emergency

Environmental science has risen in importance in the high school and university curriculums during the last few decades due to environmental emergency. An environmental emergency refers to a sudden and severe event or situation that poses an immediate threat to the environment and may also have a significant impact on human health, property, or natural resources. These emergencies can arise from natural disasters, industrial accidents, or human activities that result in severe environmental damage. Environmental emergencies require swift and coordinated responses to mitigate the risks, minimize the damage, and protect both the environment and human well-being (Donna Rescorl et al., 1995).

### Role of education in public awareness

In response to environmental emergencies, governments, international organizations, and local communities work together to mobilize resources, develop emergency response plans, and coordinate relief efforts. Prevention and preparedness are crucial elements in minimizing the impact of environmental emergencies (Tang et al., 2022). Education is a powerful tool in addressing and solving environmental problems, as it plays a crucial role in raising awareness, fostering understanding, and promoting sustainable practices. In today's world, where environmental issues are becoming increasingly urgent, equipping individuals with knowledge and skills to become environmentally conscious and responsible citizens is paramount. Education not only empowers individuals to make informed decisions and take environmentally friendly actions but also serves as a catalyst for collective action and systemic change. UNESCO has called for Education for Sustainable Development to be a core component of all education systems at all levels by 2025 (UNESCO Declares Environmental Education Must Be a Core Curriculum Component by 2025, 2021).

Education is a powerful tool in addressing and solving environmental problems, as it plays a crucial role in raising awareness, fostering understanding, and promoting sustainable practices. In today's world, where environmental issues are becoming increasingly urgent, equipping individuals with knowledge and skills to become environmentally conscious and responsible citizens is paramount. Education not only empowers individuals to make informed decisions and take environmentally friendly actions but also serves as a catalyst for collective action and systemic change (Pauw et al., 2015).

### Environmental education

One of the key aspects of environmental education is raising awareness among all groups of students regardless of their major of study. By educating people about the current state of the environment, the causes and

consequences of environmental problems, and the importance of biodiversity and ecosystems, individuals become more conscious of the urgent need for action. Environmental education provides a platform to communicate scientific findings, share real-world examples, and highlight the interconnectedness of environmental issues with social, economic, and cultural aspects of our lives (Ali et al., 2023)..

In addition to individual actions, education also plays a significant role in shaping policies, practices, and institutions. It equips future leaders, policymakers, and professionals with the knowledge and tools necessary to address environmental challenges effectively. By integrating environmental education into formal curricula, vocational training programs, and professional development initiatives, societies can ensure that environmental considerations are integrated into various sectors and decision-making processes (Fang et al, 2023).

Furthermore, education promotes a sense of environmental stewardship and fosters a connection with nature. It encourages individuals to appreciate the intrinsic value of the environment and recognize the need for its protection. Through hands-on experiences, outdoor activities, and environmental projects, education instills a sense of wonder and respect for the natural world, fostering a lifelong commitment to sustainable practices (Mayer et al., 2004).

### **Problem statement**

The aim of this study is to promote environmental education as a core curriculum component for all students. Education, encompassing formal learning, public awareness, and training, should be acknowledged as a transformative process that empowers individuals and societies to unlock their maximum capabilities. Its significance lies in promoting sustainable development and enhancing people's abilities to tackle environmental and developmental challenges. Historically, education played a secondary role in addressing environmental and developmental issues, but its importance has grown significantly. Education possesses the potential to shape people's attitudes and behaviors towards their surroundings. Environmental education specifically emphasizes the acquisition of knowledge, skills, and attitudes necessary to effectively address and solve environmental problems.

### **Method**

For this study, statistical data on the overall number of students and the number of students enrolled in pure environmental majors were collected and evaluated. The data collection process involved accessing relevant databases and records from educational institutions to obtain accurate and up-to-date information. The collected data were then organized and analyzed using statistical techniques to gain insights into the enrollment trends and the proportion of students engaged in pure environmental majors.

In order to assess the level of awareness, actionability, and career prospects among students after attending

environmental science classes, a comprehensive survey was developed. The survey targeted students that complete the ADA University Introduction to Environmental Science class from diverse educational backgrounds (political sciences, international relation, law, business, etc.). The survey aimed to gather valuable insights into the knowledge and understanding gained by students during their environmental science education. The awareness of students was evaluated to gauge their understanding of key environmental issues, such as climate change, pollution, and sustainability. Furthermore, the actionability of students was assessed to determine whether they felt empowered to take individual and collective actions to address these challenges. Lastly, the survey explored career perspectives to shed light on students' aspirations and potential paths within the field of environmental science, promoting informed decision-making and future opportunities. The development of this survey aimed to gain valuable feedback and enhance the effectiveness of the environmental science curriculum, ultimately fostering a generation of environmentally conscious and proactive individuals.

The questions were created in the Google Survey form and the link was sent to students via Blackboard system. The participants do not need to provide their email address or their name. This makes it easier for them to access the form through any device (computer or phone). The questionnaire consists of 12 multiple choice questions and one open question. The responses included five options: "Strongly disagree, Disagree, Neutral, Agree, and Strongly agree."

**Table 1.** The questions used in the survey

#	Question
1	I understand modern environmental problems better than before
2	I feel more engaged in the modern environmental issues
3	I want to find ways to take action against environmental issues more than before I took the class
4	I feel more helpless against environmental problems
5	Since taking the class, I have taken steps to counter environmental problems (even tiny steps count!)
6	Please list the steps or actions you have taken to counter environmental problems (even small steps, like sharing facts with friends and reducing plastic use, count!) Otherwise, leave empty
7	Since taking the class, I wish I behaved more sustainably
8	The class has prompted me to consider integrating environmental questions into my career plans
9	Since taking the class, I feel more equipped to take action against environmental problems
10	I have decided to link my future career with environmental questions
11	I believe the class is useful to people from any career path
12	I believe introductory environmental classes should be mandatory to all high school and university students

## Results

### Statistical data results

In Azerbaijan, during the period of 2021 to 2022, a total of 36,448 students successfully completed their bachelor's degrees. While this demonstrates the dedication and hard work of these students, it is notable that only a small fraction of them, around 1,000 students per year, chose to pursue studies specifically focused on the environment.

### ADA Case Study: Introduction to Environmental Science Course

ADA university introduced the Environmental Science Course for students from all disciplines, including policymaking, economy, technology development, and science. Since the Fall of 2017 more than 2,500 students have successfully completed the course as part of their bachelor's studies. The program includes both theoretical and field studies. In addition, the study of environmental ethics is of paramount importance for students as it employs a sense of moral responsibility, fosters an understanding of environmental issues, and equip them with necessary knowledge and skills needed to address environmental challenges. To shape the next generation of environmentally conscious citizens and professionals, and increased environmental awareness has led ADA University opened a course of Environmental Ethics within the scope of General Education Program. Each academic year around 600 students take this course as the university core course.

### Results of survey

Through the analysis of survey responses, compelling evidence emerged that confirmed the positive outcomes of environmental science education. The results indicated that a significant majority of students experienced a substantial increase in their understanding of key environmental concepts and challenges, such as climate change, biodiversity loss, and sustainable practices (Figure 1).

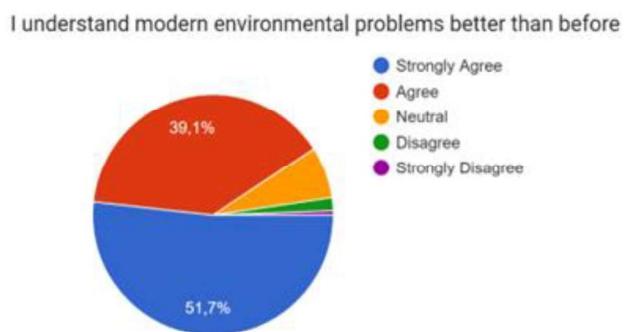


Figure 1. Survey result on Awareness Increase

Furthermore, the survey revealed notable shifts in students' attitudes towards environmental conservation, with

an enhanced sense of personal responsibility in adopting eco-friendly behaviors (Figure 2). Importantly, the findings demonstrated that the environmental science classes were highly engaging, informative, and relevant to students' everyday lives.

I feel more engaged in the modern environmental issues

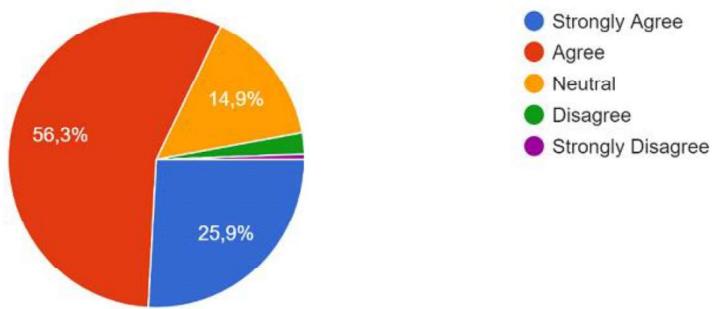


Figure 2. Students' Engagement in the modern environmental issues

More than 86.8% of participants agreed and strongly agreed that the Introduction into Environmental Sciences (IES) classes are useful to students from any career path, and only 3.5% of responders disagreed and strongly disagreed. Most students (85%) participated in the survey agreed that IES classes should be mandatory for all high school and university students. More than 80% of participants indicated that feel more engaged in the modern environmental issues.

This research provides valuable insights into the transformative potential of environmental science education, empowering students from various backgrounds to become active and informed environmental stewards (Figure 3).

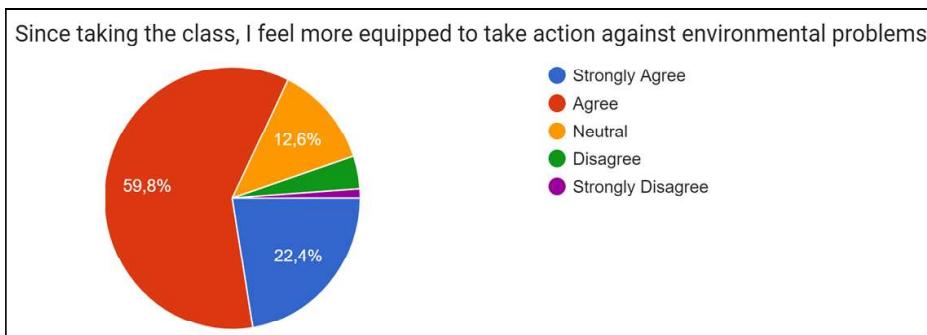


Figure 3. Knowledge capacity enhancement

Around 65% of students were prompted to consider integrating environmental questions into their career plans and besides that more than 30% of responders decided to link their future career with environmental questions (Figures 4 and 5).

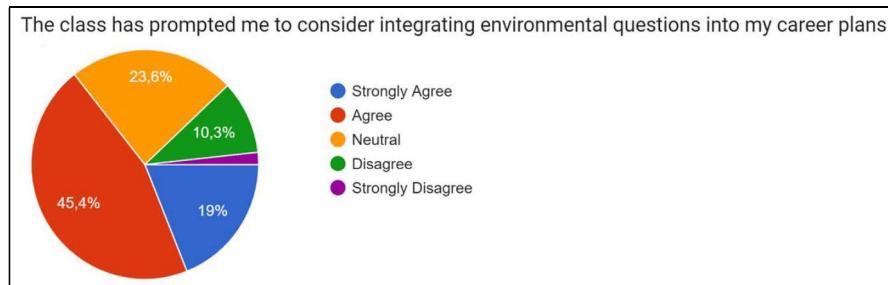


Figure 4. Impact of classes on the career plans

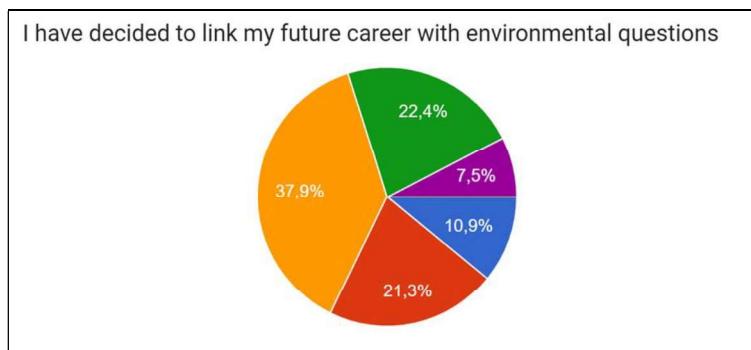


Figure 5. Linkage of the future career with environmental aspects

According to the survey, 90.8% of participants mentioned that they started understanding modern environmental problems better than before. In addition, more than 50% of students reported each of the following emotions: sad, anxious, angry, powerless, helpless, and guilty consistent with other publications (Hikman, 2021).

Most participants (82.2%) stated that feel more equipped to take actions against environmental problems, which shows that understanding and introduction into practical applications increased self-belief. Around 80% of participants reported feeling more responsibility towards climate issues. According to the survey, more than 70% reported to have taken actions regarding environmental issues (Figure 6).

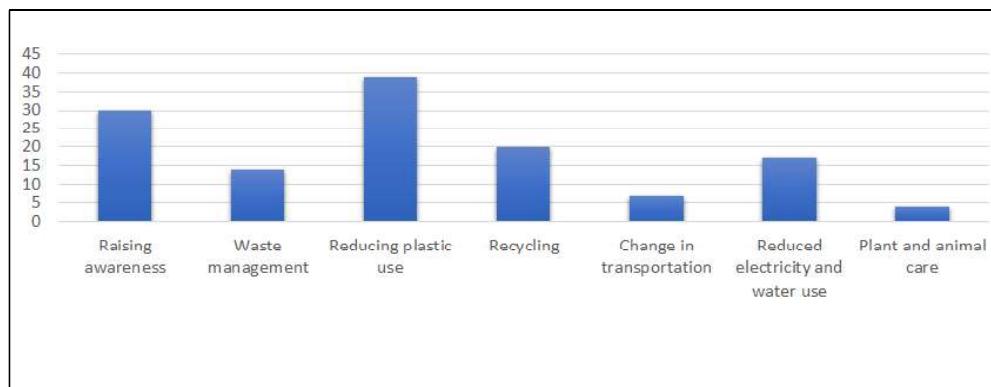


Figure 6. Actions reported by students.

Following the completion of environmental science classes, many students showcased their success through impactful projects. These projects reflected their newfound knowledge and skills acquired during their coursework. One notable project involved the design and implementation of a community recycling program, which significantly reduced waste and promoted sustainable practices in the local area. Another student undertook a research project on the effects of pollution on nearby water bodies, leading to important findings that highlighted the need for stricter environmental regulations.

Additionally, some students-initiated awareness campaigns, organizing events and workshops to educate their peers and the wider community about environmental conservation. These successful projects exemplify the practical application of classroom teachings and demonstrate how students can contribute positively to addressing environmental challenges.

Such accomplishments further highlight the tangible benefits of environmental science courses in empowering students to become proactive agents of change in their communities. These are some examples of the successful projects: Reuse for Youth, Reducing plastic usage; Caspian Sea Beach Cleaning Project; "Eat or Feed" decrease food waste and promote sustainability by reusing leftover food; "EcoPaws" increases public awareness about the negative effects of food waste and many others.

To provide ADA students with more comprehensive approaches to practical segments of the local environmental issues, the university cooperates with the local and international companies. With cooperation of the Ministry of Ecology and Natural Resources of the Republic of Azerbaijan and GIZ (The Branch of German Federal Ministry for Economic Cooperation and Development) the university organizes study trips to national parks to enhance students' projects on the environmental issues. About 20 ADA students' effective environmental initiatives submit applications for the Haji Zeynalabdin Taghiyev Award, the highest award of the university for social projects.

## Discussion

Empowering individuals is another crucial aspect of environmental education. Through education, individuals gain a sense of agency and become aware of their role as active participants in environmental conservation. They learn about sustainable practices, such as reducing waste, conserving energy, and adopting eco-friendly lifestyles. Education empowers individuals to make informed choices and take action to mitigate environmental degradation in their daily lives. Additionally, education equips individuals with the skills necessary to advocate for policy changes and implement effective environmental initiatives at local, national, and international levels. Furthermore, education plays a pivotal role in shaping policies and practices related to environmental protection. Through research, analysis, and informed decision-making, policymakers can develop effective strategies to address environmental challenges. Educational institutions, in collaboration with government bodies and non-governmental organizations, can contribute to the formulation of environmentally conscious policies and

provide the necessary expertise for their implementation. By integrating environmental education into school curricula, policymakers can ensure that future generations are equipped with the knowledge and skills needed to navigate environmental complexities. As we strive to create a sustainable future, investing in comprehensive and inclusive environmental education becomes crucial. It is essential to reach individuals from diverse backgrounds and communities, ensuring equal access to environmental education regardless of socioeconomic status or geographic location. By promoting inclusivity, we can cultivate a sense of global environmental responsibility and foster collaboration across borders.

## Conclusion

In conclusion, education serves as a powerful tool in solving environmental problems and promoting environmental awareness on a global scale. The role of education goes beyond simply imparting knowledge; it plays a vital role in shaping individuals' attitudes and behaviors towards the environment. By raising awareness about pressing environmental issues, such as climate change, deforestation, and pollution, education enables individuals to comprehend the magnitude and complexity of these challenges. Moreover, environmental education fosters the development of critical thinking skills, enabling individuals to analyze environmental problems from multiple perspectives and propose innovative solutions.

In summary, education is a powerful catalyst for change in the face of environmental challenges. By raising awareness, developing critical thinking skills, empowering individuals, and shaping policies and practices, environmental education plays a fundamental role in addressing urgent environmental issues. It equips individuals with the knowledge, values, and skills needed to protect and preserve our planet for generations to come. Therefore, embracing and investing in comprehensive environmental education is a crucial step towards building a sustainable and resilient future for all.

## Recommendations

Environmental courses have become increasingly vital in today's world as we face pressing challenges related to sustainability, climate change, and conservation. These courses provide students with a comprehensive understanding of the environment, its interconnected systems, and the human impact upon them. Currently different environmental courses are thought in different universities in Azerbaijan: Baku State University, Azerbaijan State Economic University, Azerbaijan State Agriculture University, Azerbaijan Technology University, Mingachevir State University, Lankaran State University, Sumgait State University, West Caspian University, "Odlar Yurdu" University.

With the urgency to address environmental issues and create a sustainable future, educational institutions have incorporated a diverse range of environmental courses into their curricula. It will aid promoting social and economic well-being while minimizing harm to the environment, and gain insights into the potential benefits

and challenges of implementing sustainable practices at individual, community, and global levels. In this regards, here are the following recommendations for the introduction of environmental classes to all students:

- Curriculum Integration: It is recommended to integrate environmental education into various subjects across the curriculum, including science, social studies, and the arts. This interdisciplinary approach will provide students with a holistic understanding of environmental issues and their interconnectedness with other disciplines.
- Teacher Training and Professional Development: Comprehensive teacher training programs and ongoing professional development opportunities should be provided to educators. This will equip them with the necessary knowledge and pedagogical skills to effectively teach environmental concepts. Emphasis should be placed on innovative teaching methodologies, hands-on learning experiences, and the use of technology to enhance engagement and understanding.
- Practical Experiences: Incorporating practical experiences such as field trips, outdoor activities, and hands-on experiments is highly recommended. These experiences will enhance students' engagement and understanding of environmental issues by allowing them to observe and interact with the natural environment firsthand.
- Community Engagement: Collaboration with local communities, environmental organizations, and experts is essential. This collaboration will provide students with opportunities for real-world application of their knowledge, engaging them in community projects, environmental restoration initiatives, and sustainability campaigns.
- Global Perspectives: Introducing global perspectives on environmental issues is crucial. Incorporating case studies and discussions on environmental issues from different regions of the world will broaden students' understanding of the interconnected nature of environmental challenges and the importance of global cooperation.
- Assessment and Evaluation: Developing appropriate assessment methods to evaluate students' knowledge, attitudes, and behaviors related to the environment is recommended. Assessments should go beyond traditional exams and include performance-based tasks, project-based assessments, and portfolios that reflect students' understanding and application of environmental concepts.
- Long-Term Commitment: It is important to consider environmental education as an ongoing and long-term commitment rather than a one-time initiative. Continuous evaluation, feedback, and improvement of environmental education programs will ensure their effectiveness and relevance over time.

Implementing these recommendations will establish a solid foundation for fostering environmental literacy among students and empower them to become active and responsible stewards of the environment. By integrating environmental classes into all students' education, we can cultivate a generation equipped with the knowledge, skills, and values necessary to address environmental challenges and create a sustainable future.

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